Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
	)	
Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands	)	ET Docket No. 95-183 (Terminated)
	)	
Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands	)	PP Docket No. 93-253 (Terminated)
	)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	)	RM-11664

COMMENTS OF AVANTI COMMUNICATIONS GROUP PLC.

Avanti Communications Group plc ("Avanti") is a UK head-quartered Ka-band satellite operator based in London, delivering high speed data communication services across inter-alia Europe, Africa and the Middle East. Avanti has already committed over US $1 billion in the deployment of existing and already procured Ka-band satellite systems. A substantial component of Avanti's investments in Ka-band satellite systems has been employed in the procurement of major space-segment systems and ground-segment systems from US suppliers. Avanti also expects to supply its Ka-band satellite communications services to various US government and private sector organizations. Avanti is pleased to submit comments in response to the Commission's Notice of Inquiry ("Inquiry") in the above-referenced proceeding[1].

Avanti is supportive of the European Satellite Operator's Association ("ESOA") contribution response to the above FCC Inquiry.

In the inquiry, the Commission pursues to inspect the possible provision of International Mobile Telecommunications ("IMT") services in bands above 24 GHz. Avanti applauds this

[1] GN Docket No. 14-177. Use of Spectrum Bands Above 24 GHz For Mobile Radio Services

effort by the FCC to receive comments from stakeholders which have a direct interest in the usage of spectrum above 24 GHz. Avanti provides specific comments in this inquiry to raise concerns - much like other satellites operators that disruption to current and planned services in Ka-band (inter-alia the 27.5 – 30.0 / 17.3 – 20.2 GHz bands) should not be caused, noting the already significant US$ multi-billion space industry investments in Ka-band geostationary and non-geostationary satellite systems.

II. BACKGROUND.

The frequency bands above 24 GHz and below 31 GHz are currently well used by a large number of services, including satellite communication systems.

Satellite networks are already designed to efficiently share spectrum with many other spectrum users. Satellite networks also extensively share with each other much of the same spectrum, employing precise orbital spacing and directional antennas to avoid unacceptable interference into each other.

Satellite systems which do not involve the use of ubiquitous earth stations often also share with terrestrial fixed services. However, high density IMT / 5G services would fundamentally break these carefully calibrated sharing assumptions and thus are not compatible with the existing intensive use of spectrum between 6 GHz and 31 GHz. Avanti is not aware of a prior case where high density mobile service (2G, 3G, 4G) involving ubiquitous deployment of mobile terminals and base stations has ever successfully shared spectrum in the medium to longer term on a sustainable basis with satellite services where satellite earth stations have been ubiquitously deployed. The deployment of high density mobile services on ostensible shared basis with other allocated radio services eventually and invariably leads to the displacement in the almost all cases of the other incumbent radio services or satellite services.

III. SATELLITE SERVICE INVESTMENTS WORLDWIDE IN BAND ABOVE 24 GHz.

Many satellite system operators around the world have made large investments into networks that currently operate or plan to operate global or regional satellite services using Ka-band frequencies. The SIA and ESOA submissions to this FCC NOI proceeding provide the relevant information. These satellite systems already provide invaluable services in many regions around the world and will continue to grow rapidly. These satellite systems are also enablers for global terrestrial operators including delivery of media and broadband services. Satellite systems will become integral part of the future 5G ecosystem.

IV. EXISTING STUDIES ON FREQUENCY BANDS FOR 5G / IMT.

Studies in Europe for example under EU funded METIS 2 program have identified various frequency bands above 31 GHz as 'high priority' candidates for the future accommodation of 5G terrestrial service which are envisaged by their proponents to require wide contiguous segment of frequencies (typically > 800 MHz). Avanti encourage the FCC to study this report by the METIS program and consider their evaluation for suitable candidate bands for IMT / 5G.

The METIS assessment took into consideration the current regulation applied in the band, with emphasis on the European situation, as well as the physical propagation properties of the bands. The applied methodology and assessment emphasized short range usage, which is in particular applicable to ultra-densely deployed networks. The summary of this band assessment is reproduced in Figure 1 and Figure 2, in which high priority bands are those that are more favourable from a regulatory and technical points of view.

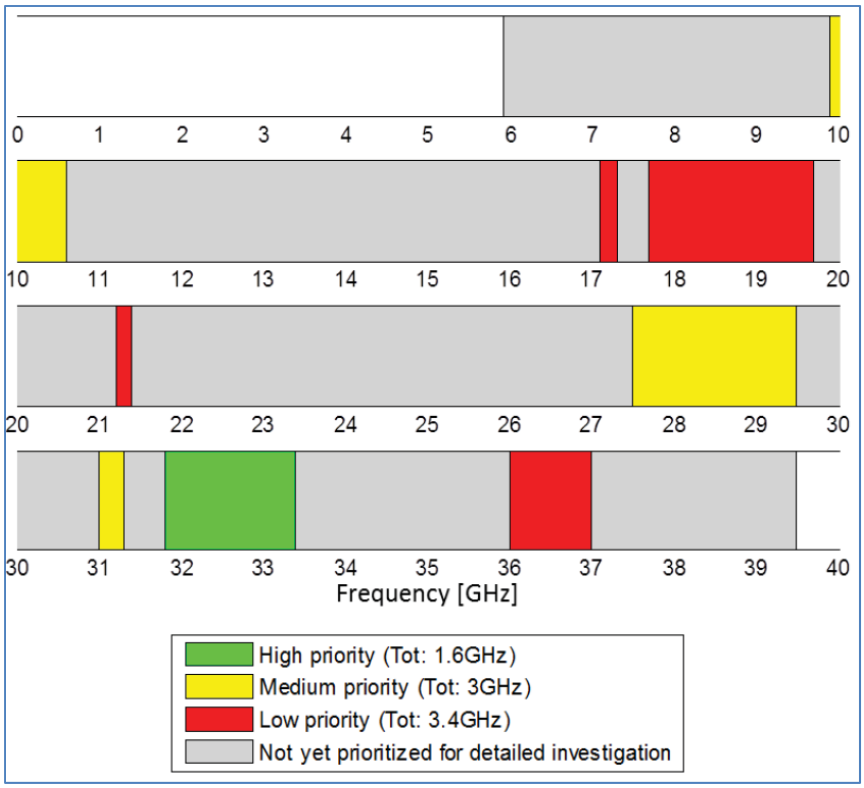

Figure 1: Overview of spectrum opportunities for 5.925 - 40.5 GHz

[2] METIS_D5.3_v1, Section 2.5 (Document Number: ICT-317669-METIS/D5.3, dated 29-August-2014)

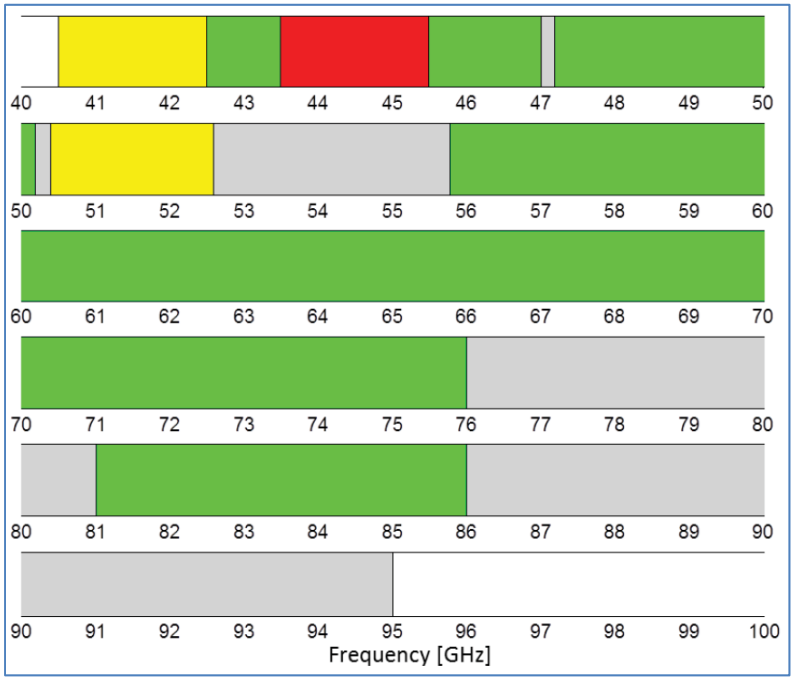

Figure 2: Overview of spectrum opportunities for 40.5 – 100 GHz

From the above results, it should be apparent that significantly more opportunities exist in higher frequency bands above 31 GHz than in lower frequency bands below 31 GHz for the accommodation of 5G terrestrial radio systems. This is partly due to the increased isolation between co-existing terrestrial radio systems that follows from the propagation properties in higher bands. It is also a consequence of the applied search criteria, in particular the assessment focused on finding very wide bands of contiguous spectrum (1 GHz was preferable). Such bands are difficult to find in lower frequencies due to current regulation and intensive usage.

To further shed light on the opportunities in the 5.925 – 31 GHz range, an additional band assessment with modified assessment criteria has been performed. In this assessment, a reduced target minimal contiguous bandwidth of 60 MHz was used, and a larger focus was given to outdoor deployments. The used criteria represent a situation where a wide area covering IMT system is to co-exist with the currently deployed systems in the band. The decreased target bandwidth increases the opportunities significantly, but outdoor deployments and wider coverage implies more difficult co-existence with incumbent services. The resulting assessment summary is given in Figure 3.

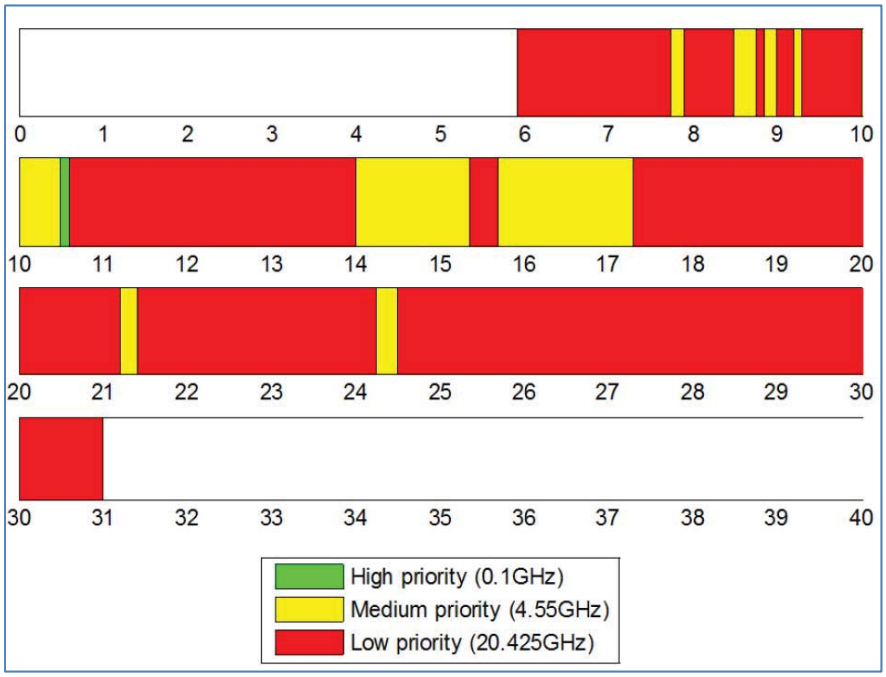

Figure 3: Refined spectrum opportunities for 5.925 – 40.5 GHz

It is apparent from the above that this does indeed impose a difficult situation for the potential introduction of future 5G terrestrial systems in the frequency bands below 31 GHz.

It is very important to recognise that technology solutions for 5G mobile services are being developed in various frequency bands above 31 GHz and the solution set for 5G radio systems is not restricted to bands between say 24 and 31 GHz. For example, Samsung has tested 5G systems at circa 39 GHz and high capacity RLANs at circa 61 GHz.[3]

Furthermore, at least one major mobile operator has suggested that bands in the 43.5-47 GHz range be considered for 5G mobile, and that it would be desirable to avoid compatibility issues in satellite spectrum allocations.[4]

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[3] Field trials conducted "at New York University and the University of Texas with funding from the US Army and Samsung… found that **39GHz mobile base stations can sustain 100 percent coverage in cells with a 200-meter radius in high-density urban areas**," the FCC said. (from: http://arstechnica.com/information-technology/2014/10/gigabit-cellular-networks-could-happen-with-24ghz-spectrum-fcc-says/) and **Samsung develops 60GHz WiFi capable of 4.6Gbps, will be in devices next year** (from: http://www.extremetech.com/computing/191872-samsung-develops-60ghz-wifi-capable-of-4-6gbps-will-be-in-devices-next-year)

The above set of assessments provide indications for the FCC inquiry on which bands could be included in initial considerations when starting the regulatory process of identifying spectrum for future 5G terrestrial systems. Given the above, Avanti believes that as there are extensive opportunities to accommodate future 5G terrestrial radio systems exist in higher mmWave frequencies (i.e. above 31.0 GHz) as is shown by the METIS study, rather than in the lower sub-mmWave bands between 6 GHz to 31.0 GHz. Avanti believes the bands between 24 GHz and 31 GHz should not be considered for accommodation of future 5G radio systems because of significant and rapidly increasing use by other space and terrestrial radio services.

Avanti believes that the prospects at ITU / WRC level (possibly as early as WRC-2018) to achieve common global harmonized frequency bands to support future 5G / IMT radio systems would be considerably greater in bands above 31 GHz than in bands below 31 GHz.

Avanti would encourage the FCC to identify relevant frequency bands for 5G terrestrial radio systems above 31 GHz, since that would enable the sustainable growth of future 5G terrestrial eco-system above 31 GHz and the sustainable growth of satellite systems in particular in bands below 31 GHz, without creating near term, medium term or longer term highly disruptive spectrum conflicts between future 5G terrestrial services and current and future innovative space services.

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[4] See Vodafone response to UK Ofcom consultation on WRC-15: http://stakeholders.ofcom.org.uk/consultations/wrc15/?showResponses=true&pageNum=8#responses

V. CONCLUSION

Avanti recommends a 'win-win' approach would involve the identification of frequency bands for 5G terrestrial radios systems in relevant frequency bands allocated already on a primary basis to the mobile services above 31 GHz, where possible in frequency bands not allocated on a primary or co-primary basis in the United State or by the ITU to core satellite or space services. This should enable a viable and sustainable growth outcome for all both stakeholders in the terrestrial IMT/5G community and the satellite community given also the key role both sectors play in the 21st century Digital Economy both in the USA and globally.

Respectfully submitted,

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